$$\sum_{q \in Q(m)} \pi_1(q) \le R_1(m), \ \gamma(q) \ge 0$$

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is solved using the approximation in EQ. 11, [

$$\gamma(q) = \frac{P_{21}(q,q)\pi_1(q)}{i_2(q)}$$

and the network further comprises at least one high-level network controller that controls the power constraints $R_1(q)$ [$R_1(m)$], and drives the network towards a max-min solution.

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73. (currently amended) A method as in claim 60[61], wherein each node:

is given an initial γ_0 ;

generates the model expressed in EQ. 20, EQ. 21, and EQ. 22

$$L(\gamma, \mathbf{g}, \beta) = \mathbf{g}^T \gamma, \Sigma_{q \in Q(m)} \log(1 + \gamma(q)) \ge \beta(m)$$

$$\mathbf{g} = \nabla_{\mathbf{y}} f(\mathbf{y}_0)$$
];

updates the new γ_{α} from EQ. 23 and EQ. 24

[
$$\gamma_* = \operatorname{arg\ min}_{\gamma} L(\gamma, \mathbf{g}, \beta)$$
 , $\gamma_{\alpha} = \gamma_0 + \alpha(\gamma_* - \gamma_0)$];

determines a target SINR to adapt to; and,

updates the transmit power for each link q according to EQ. 25 and EQ. 26

$$\pi_2(q) = \gamma_\alpha i_1(q) / |h(q)|^2$$

$$\pi_1(q) = \gamma_\alpha i_2(q) / |h(q)|^2 \quad 1.$$

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74. (currently amended) A method as in claim 60[61], for each node wherein the

1101 transmit power relationship of EQ. 25 and EQ 26 [

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$$\pi_2(q) = \gamma_{\alpha} i_1(q) / |h(q)|^2$$
1103
$$\pi_1(q) = \gamma_{\alpha} i_2(q) / |h(q)|^2$$

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is not known, that: 1104

uses a suitably long block of N samples is used to establish the relationship, where

N is either 4 times the number of antennae or 128, whichever is larger; 1106

uses the result to update the receive weights at each end of the link;

optimizes the local model as in EQ. 23 and EQ. 24 [

$$\gamma_* = \arg\min_{\gamma} L(\gamma, \mathbf{g}, \beta)$$

$$\gamma_{\alpha} = \gamma_0 + \alpha (\gamma_* - \gamma_0)$$

and then applies [1111

$$\pi_2(q) = \gamma_\alpha i_1(q) / |h(q)|^2$$

1113
$$\pi_1(q) = \gamma_{\alpha} i_2(q) / |h(q)|^2$$
] EQ. 25 and EQ. 26.

A method as in claim 60[61] that, for an aggregate proper 75. (currently amended) subset m:

for each node within the set m, inherits the network objective function model given in EQ. 28, EQ. 29, and EQ. 30 [

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$$L_m(\gamma, \mathbf{g}, \beta) = \sum_{q \in Q(m)} \mathbf{g}_q \gamma(q)$$

$$\Sigma_{q \in Q(m)} \log(1 + \gamma(q)) \ge \beta(m)$$

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$$g(q) = i_1(q)i_2(q)/|h(q)|^2$$
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eliminates the [a] step of matrix channel estimation, transmitting instead 1122 from that node as a single real number for each link to the other end of 1123 said link an estimate of the post beamforming interference power; 1124 and, 1125 receives back for each link a single real number being the transmit power. 1126 1127 76. (original) A method as in claim 75 [74], that for each pair of nodes assigns to the 1128 one presently possessing the most processing capability the power management 1129 computations. 1130 1131 1132 A method as in claim 74[75] that estimates the transfer 77. (currently amended) 1133 gains and the post beamforming interference power using simple least squares estimation 1134 1135 techniques. 1136 1137 A method as in claim 74[75]that, for estimating the transfer 78. (currently amended) 1138 gains and post beamforming interference power: 1139 1140 instead solves for the transfer gain h using EQ. 31 1141 $[y(n) = hgs(n) + \varepsilon(n)];$ 1142 uses a block of N samples of data to estimate h using EQ. 32 [1143 $h = \frac{\sum_{n=1}^{N} s^*(n) y(n)}{\sum_{n=1}^{N} |s(n)|^2 g}$ 1144

obtains an estimation of residual interference power \mathbf{R}_e [$R_{arepsilon}$] using EQ. 33- [

 $R_{\varepsilon} = \left\langle \left| \varepsilon(n) \right|^2 \right\rangle$]; 1146 $=\frac{1}{N}\sum_{n=1}^{N}\left(\left|y(n)\right|^{2}-\left|ghs(n)\right|^{2}\right)$

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and, 1147

obtains knowledge of the transmitted data symbols s(n) from using

remodulated symbols at the output of the codec. 1149

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A method as in claim 77 [78] wherein, instead of obtaining 79. (currently amended) knowledge of the transmitted data symbols S(n) from using remodulated symbols at the output of the codec, the node uses the output of a property restoral algorithm used in a blind beamforming algorithm.

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A method as in claim 77 [78] wherein, instead of obtaining 80. (currently amended) knowledge of the transmitted data symbols S(n) from using remodulated symbols at the output of the codec, the node uses a training sequence explicitly transmitted to train beamforming weights and asset the power management algorithms.

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A method as in claim 77 [78] wherein, instead of obtaining 81. (currently amended) knowledge of the transmitted data symbols s(n) from using remodulated symbols at the output of the codec, the node uses any combination of:

1167 1168 1169 the output of a property restoral algorithm used in a blind beamforming algorithm; a training sequence explicitly transmitted to train beamforming weights and asset the power management algorithms;

1170 or,

other means known to the art. 1171 1172 1173 A method as in claim 60[61], wherein each node 82. (currently amended) 1174 incorporates a link level optimizer and a decision algorithm, as illustrated in Figure 1175 32Aand 32B. 1176 1177 A method as in claim 81[82], wherein the decision 83. (currently amended) 1178 algorithm is a Lagrange multiplier technique. 1179 1180 1181 A method as in claim 60[61], wherein the solution to EQ. 3 84. (currently amended) 1182 [$\min_{\pi_1(q)} \sum_{\sigma} \pi_1(q) = \mathbf{1}^T \; \pi_1$] is implemented by a penalty function technique. 1183 1184 1185 A method as in claim 83[84], wherein the penalty function 85. (currently amended) 1186 1187 technique: takes the derivative of $\gamma_{(q)}$ [$\gamma(q)$] with respect to π_1 ; 1188 and, 1189 uses the Kronecker-Delta function and the weighted background noise. 1190 1191 1192 A method as in claim 83[84], wherein the penalty function 86. (currently amended) 1193 1194 technique neglects the noise term. 1195 1196 A method as in claim 83[84], wherein the penalty function 1197 87. (currently amended) technique normalizes the noise term to one. 1198 1199

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A method as in claim 60[61], wherein the approximation 88. (currently amended) 1201 uses the receive weights. 1202

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A method as in claim 60[61], wherein adaptation to the 89. (currently amended) 1205 target objective is performed in a series of measured and quantized descent and ascent 1206 steps.

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A method as in claim 60[61], wherein the adaptation to the 90. (currently amended) target objective is performed in response to information stating the vector of change. 1210

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A method as in claim 60[61], which uses the log linear 1213 91. (currently amended) mode in EQ. 34

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$$\beta_q \approx \log \left(\frac{a \ \pi_1(q) + a_0}{b \ \pi_1(q) + b_0} \right) = \hat{\beta}_q(\pi_1(q))$$

and the inequality characterization in EQ. 35 [$\hat{\beta}_q(\pi_1(q)) \ge \beta$] to solve the 1216 approximation problem with a simple low dimensional linear program. 1217

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A method as in claim 60[61], develops the local mode by 92. (currently amended)

matching function values and gradients between the current model and the actual

1222 function.

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A method as in claim 60[61], which develops the model as 93. (currently amended) a solution to the least squares fit, evaluated over several points. 1226

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